

levels pertinent to this part of the regulation. It includes reference to section VIII of the ASME Code for definitions and explanations.

TABLE 54.10-5—PICTORIAL INTER-RELATION AMONG VARIOUS PRESSURE LEVELS WITH REFERENCES TO SPECIFIC REQUIREMENTS <sup>1</sup>

Pressure differential, psi <sup>2</sup>	Test pressures <sup>3</sup>	Relief device pressure settings	Pressures upon which relief device flow capacity is based
	Burst proof test (UG-101(m) of ASME Code). Yield proof test (UG-101(j) of ASME Code). Standard hydrostatic test (UG-99 of ASME Code). Pneumatic test (UG-100 of ASME Code). Rupture disk burst (§ 54.15-13).		Fire exposure, 120% MAWP. Normal, 110% MAWP.
	Maximum allowable working pressure (MAWP), UG-98 and UA-60(a) of ASME Code.	Maximum allowable working pressure (MAWP), UG-98 and UA-60(a) of ASME Code.	Maximum allowable working pressure (MAWP), UG-98 and UA-60(a) of ASME Code.
	Design pressure, UG-21, and UA-60(b) of ASME Code. Operating pressure (UA-60(f) of ASME Code).	Design pressure, UG-21 and UA-60(b) of ASME Code. Safety or relief value setting (UG-133 of ASME Code). Operating pressure (UA-60(f) of ASME Code).	Design pressure, UG-21 and UA-60(b) of ASME Code. Operating pressure (UA-60(f) of ASME Code).

<sup>1</sup> For basic pressure definitions see § 52.01-3(g) of this subchapter.

<sup>2</sup> For pressure differentials above 3,000 pounds per square inch (p.s.i.), special requirements may apply.

<sup>3</sup> For the basis for calculating test pressures, see UA-60(e) of the ASME Code.

#### § 54.10-10 Standard hydrostatic test (modifies UG-99).

(a) All pressure vessels shall satisfactorily pass the hydrostatic test prescribed by this section, except those pressure vessels noted under § 54.10-15(a).

(b) The hydrostatic test pressure shall be at least one and one-half times the maximum allowable working pressure stamped on the pressure vessel, multiplied by the ratio of the stress value "S" at the test temperature to the stress value "S" at the design temperature for the materials of which the pressure vessel is constructed. The values for "S" shall be taken from Tables UCS 23, UNF 23, UHA 23, or UHT 23 of the ASME Code. The value of "S" at test temperature shall be that taken for the material of the tabulated value of temperature closest to the test temperature. The value of "S" at design temperature shall be as interpolated from the appropriate table. No ratio less than one shall be used. The stress resulting from the hydrostatic test shall not exceed 90 percent of the yield stress of the material at the test temperature. External loadings which will

exist in supporting structure during the hydrostatic test should be considered. The design shall consider the combined stress during hydrostatic testing due to pressure and the support reactions. This stress shall not exceed 90 percent of the yield stress of the material at the test temperature. In addition the adequacy of the supporting structure during hydrostatic testing should be considered in the design.

(c) The hydrostatic test pressure shall be applied for a sufficient period of time to permit a thorough examination of all joints and connections. The test shall not be conducted until the vessel and liquid are at approximately the same temperature.

(d) Defects detected during the hydrostatic test or subsequent examination shall be completely removed and then inspected. Provided the marine inspector gives his approval, they may then be repaired.

(e) Vessels requiring stress relieving shall be stress relieved after any welding repairs have been made. (See UW-40 of the ASME Code.)

(f) After repairs have been made the vessel shall again be tested in the regular way, and if it passes the test, the marine inspector may accept it. If it does not pass the test, the marine inspector can order supplementary repairs, or, if in his judgment the vessel is not suitable for service, he may permanently reject it.

**§ 54.10-15 Pneumatic test (modifies UG-100).**

(a) Pneumatic testing of welded pressure vessels shall be permitted only for those units which are so designed and/or supported that they cannot be safely filled with water, or for those units which cannot be dried and are to be used in a service where traces of the testing medium cannot be tolerated.

(b) Proposals to pneumatically test shall be submitted to the cognizant Officer in Charge, Marine Inspection, for approval.

(c) Except for enameled vessels, for which the pneumatic test pressure shall be at least equal to, but need not exceed, the maximum allowable working pressure to be marked on the vessel, the pneumatic test pressure shall be at least equal to 1.25 times the maximum allowable working pressure to be stamped on the vessel multiplied by the lowest ratio (for the materials of which the vessel is constructed) of the stress value "S" for the test temperature of the vessel to the stress value "S" for the design temperature (see UG-21 of the ASME Code). In no case shall the pneumatic test pressure exceed 1.25 times the basis for calculated test pressure as defined in UA-60(e) of the ASME Code.

(d) The pneumatic test of pressure vessels shall be accomplished as follows:

(1) The pressure on the vessel shall be gradually increased to not more than half the test pressure.

(2) The pressure will then be increased at steps of approximately one-tenth the test pressure until the test pressure has been reached.

(3) The pressure will then be reduced to the maximum allowable working pressure of the vessel to permit examination.

(e) Pressure vessels pneumatically tested shall also be leak tested. The

test shall be capable of detecting leakage consistent with the design requirements of the pressure vessel. Details of the leak test shall be submitted to the Commandant for approval.

(f) After satisfactory completion of the pneumatic pressure test, the vessel may be stamped in accordance with § 54.10-20. A marine inspector shall observe the pressure vessel in a loaded condition at the first opportunity following the pneumatic test. The tank supports and saddles, connecting piping, and insulation if provided shall be examined to determine if they are satisfactory and that no leaks are evident.

(g) The pneumatic test is inherently more hazardous than a hydrostatic test, and suitable precautions shall be taken to protect personnel and adjacent property.

**§ 54.10-20 Marking and stamping.**

(a) *Pressure vessels (replaces UG-116, except paragraph (k), and UG-118).* Pressure vessels that are required by § 54.10-3 to be stamped with the Coast Guard Symbol must also be stamped with the following information:

(1) Manufacturer's name and serial number.

(2) Coast Guard number, see § 50.10-30 of this subchapter.

(3) Coast Guard Symbol, which is affixed only by the marine inspector.

(4) Maximum allowable working pressure \_\_\_\_ kPa (\_\_\_\_ psig) at \_\_\_\_ °C (\_\_\_\_ °F).

(5) Class.

(6) Minimum service temperature allowed, if below -18 °C (0 °F)

(7) Water capacity in liters (U.S. gallons), if a cargo carrying pressure vessel.

(b) *Multichambered pressure vessels (replaces UG-116(k)).* In cases where more than one pressure vessel is involved in an integral construction, as with a heat exchanger, the manufacturer may elect to class the component pressure vessels differently. In such cases he shall stamp the combined structures as required in paragraph (a) of this section with information for each pressure vessel. Where an item for stamping is identical for both vessels, as with name and address of manufacturer, it need not be duplicated. However, where differences exist, each